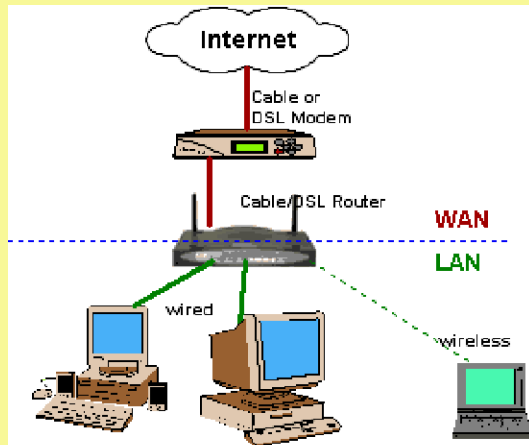# Wireless Home Computer Networking
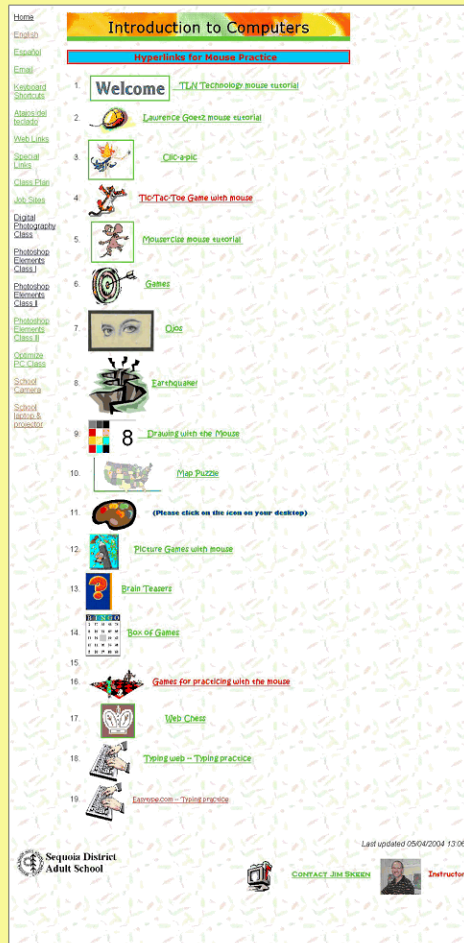
Jim Skeen

April 5 and 7, 2005

Sequoia Adult School

Where to find me

- Web page: www.jskeen.com

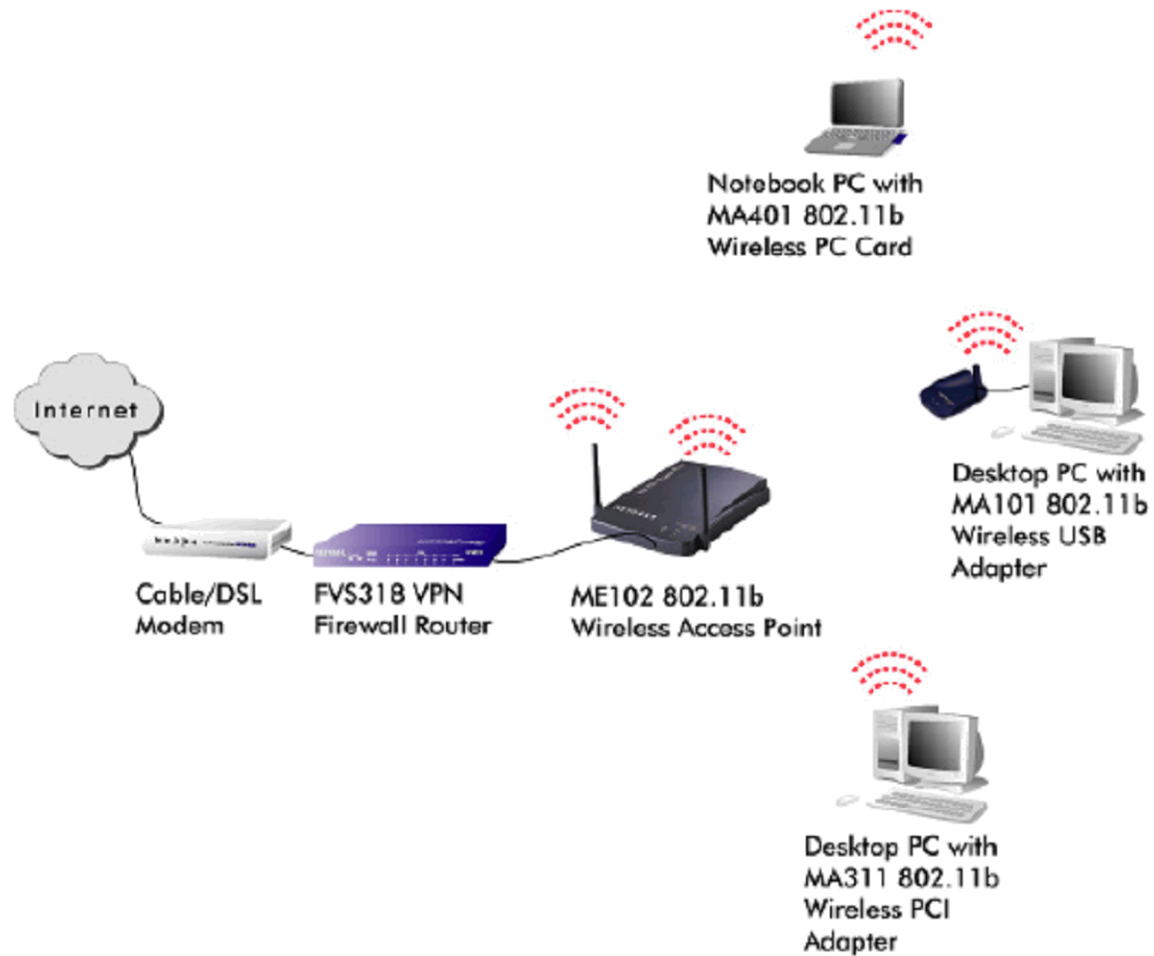- Email: jskeen@bigfoot.com

Why choose a wireless network?

- Freedom—work anywhere
- Quick, "effortless" installation
- No cables to buy
- Save cabling time and hassle
- Easy to expand

Why choose a wired network?

- Lower cost
- Fewer operational problems
- Faster speed—up to 1000Mbps
- Longer possible range
- Security

Sample Wi-Fi Configuration

Notebook PC with
MA401 802.11b
Wireless PC Card

Internet

Desktop PC with
MA101 802.11b
Wireless USB
Adapter

Cable/DSL
Modem

FVS318 VPN
Firewall Router

ME102 802.11b
Wireless Access Point

Desktop PC with
MA311 802.11b
Wireless PCI
Adapter

Example Wi-Fi Equipment

Alphabet Soup:
IEEE 802.11 Standards

- 802.11b
- 802.11a
- 802.11g

WIRELESS IEEE STANDARDS COMPARISON

	802.11b IEEE & WiFi	802.11a IEEE & WiFi	Dual Band IEEE & WiFi	802.11g Est. May '03	802.11b+ (non-standard)
Standard Ratified	Sept 99	Sept 99	Sept 99	Est. May '03	Never
Raw Data Rates	11 Mbps	54* Mbps	11 & 54** Mbps	54 Mbps	22 & 44 Mbps
Average Actual Throughput	4-5 Mbps	27 Mbps	27 Mbps	20-25 Mbps (tbd)	6 Mbps
Frequency	2.4 GHz	5 GHz	2.4 & 5 GHz	2.4 GHz	2.4 GHz
Available Spectrum	83.5 MHz	300 MHz	300 MHz	83.5 MHz	83.5 MHz
Modulation Encoding	DSSS/CCK	OFDM	DSSS/CCK & OFDM	DSSS/PBCC	PBCC
# Channels/ non-overlapping	11/3	12/8	11/3 + 12/8	11/3	11/3

* 72 Mbps in Turbo mode
** 108 Mbps in Turbo mode

Why Choose? A vs B vs G

Wireless Technology Comparison Chart

| Wireless Standard	802.11b	802.11a	802.11g
Popularity	Widely adopted. Readily available everywhere.	New technology.	New technology with rapid growth expected.
Speed	11 Mbps — Up to 11Mbps (note: cable modem service typically averages no more than 4 to 5Mbps).	54 Mbps — Up to 54Mbps (5X greater than 802.11b).	54 Mbps — Up to 54Mbps (5X greater than 802.11b).
Relative Cost	Inexpensive.	Relatively more expensive.	Relatively inexpensive.
Frequency	2.4 GHz — More crowded 2.4GHz band. Some conflict may occur with other 2.4GHz devices like cordless phones, microwave ovens, etc.	5 GHz — Uncrowded 5GHz band can coexist with 2.4 GHz networks without interference.	2.4 GHz — More crowded 2.4GHz band. Some conflict may occur with other 2.4GHz devices like cordless phones, microwave ovens, etc.
Range	100-150 — Good Range. Typically up to 100-150 feet indoors, depending on construction, building materials, room layout.	25-75 — Shorter range than 802.11b & 802.11g. Typically 25 to 75 feet indoors.	100-150 — Good Range. Typically up to 100-150 feet indoors, depending on construction, building materials, room layout.
Public Access	The number of public "hotspots" is growing rapidly, allowing wireless connectivity in many airports, hotels, college campuses, public areas, and restaurants.	X — None at this time.	Compatible with current 802.11b hotspots (at 11Mbps). Also, it is expected that most 802.11b hotspots will quickly convert to 802.11g.
Compatibility	OK 802.11b — Widest adoption.	OK 802.11a — Incompatible with 802.11b or 802.11g.	OK 802.11b 802.11g — Interoperates with 802.11b networks (at 11Mpbs). Incompatible with 802.11a.

Wireless Performance by Distance
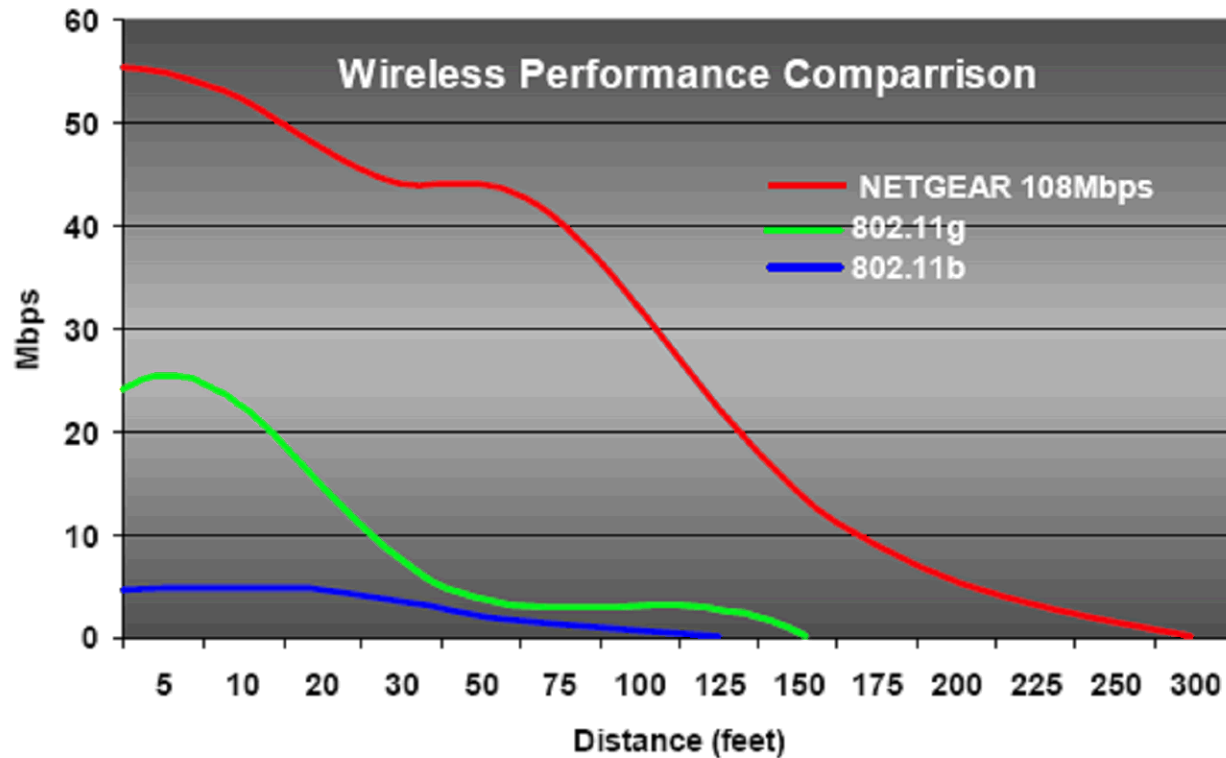
Figure 3: NETGEAR 108 Mbps Super Wireless
Performance Compared With 802.11g and 802.11b

Location, Location, Location!

- Place WAP line of sight to computer, if possible
- Locate the WAP centrally, as close as possible to the computer
- In multiple-floor houses, place WAP on an upper floor
- Avoid large metal objects, refrigerators, etc.
- For 802-11b and 802-11g systems, avoid having the microwave between the WAP and the computer. Otherwise, don't download a big file while you're popping popcorn!

The importance of Security!
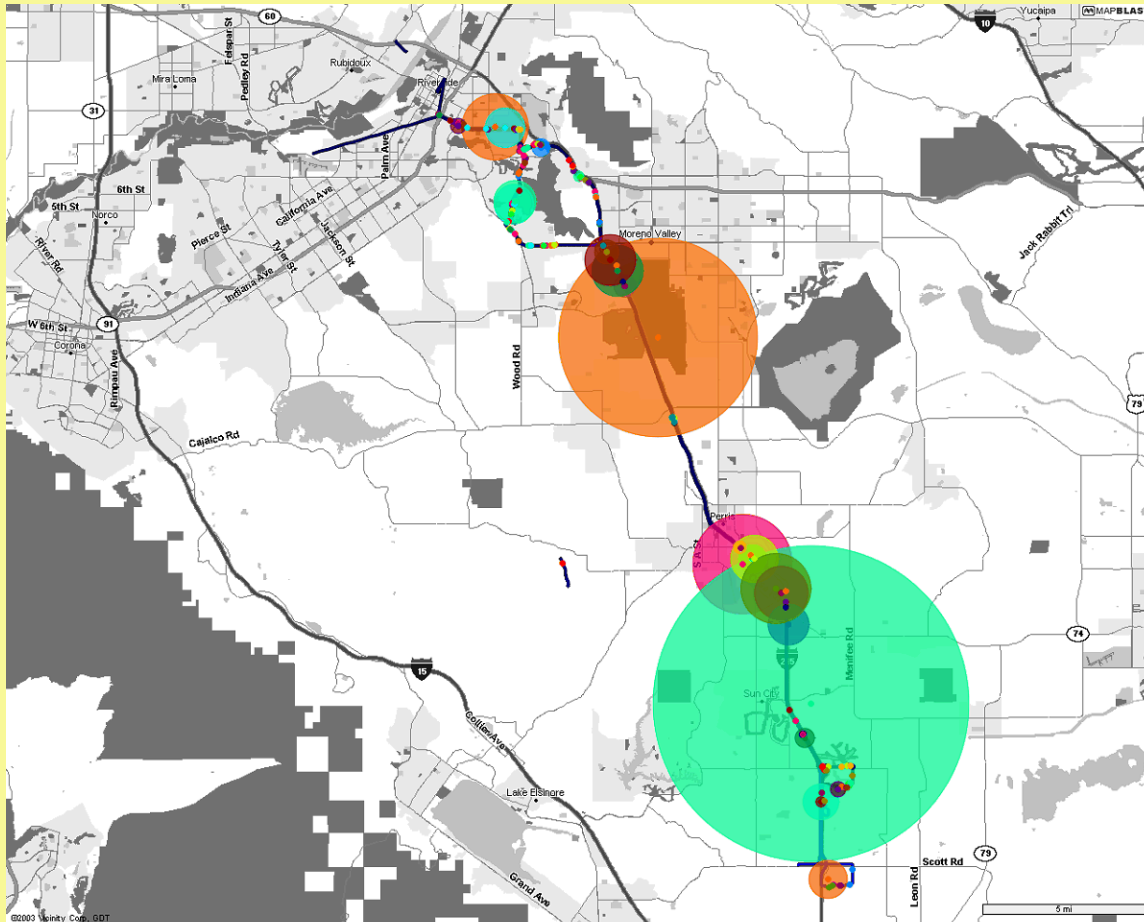
Security Recommendations for PC Users

- Use Microsoft Windows XP, either home or pro
- Upgrade to SP2 (first released August, 2004)
- Apply all critical Microsoft bug fixes
- Run a software router such as *Zone Alarm*
- Run an anti-virus package
- Run an anti-spyware package such as *Spy Sweeper*
- Use a hardware router

By default, wireless networks are left wide open!

- Hackers can piggyback on your network
- Hackers can potentially view and copy your files
- Hackers can potentially eavesdrop on email, watch you as you surf the network
- *Fortunately, credit card transactions are already encrypted*

Simple solution:
Turn on wireless security features!

Wi-Fi network security steps

- Change the name of your wi-fi network (SSID)

- Disable the SSID broadcast function

- Enable WPA encryption, 128-bit, with passphrase

- Use infrastructure mode

- Enable MAC Address authentication

Permissions Tip for PC's

- On a Windows XP computer, you must be logged on as an Administrator to run the Network Setup Wizard

- Be sure to turn on account passwords!

WinXP Troubleshooters

- Internet Connection Sharing (ICS) Troubleshooter

- Modem Troubleshooter

- File and Printer Sharing Troubleshooter

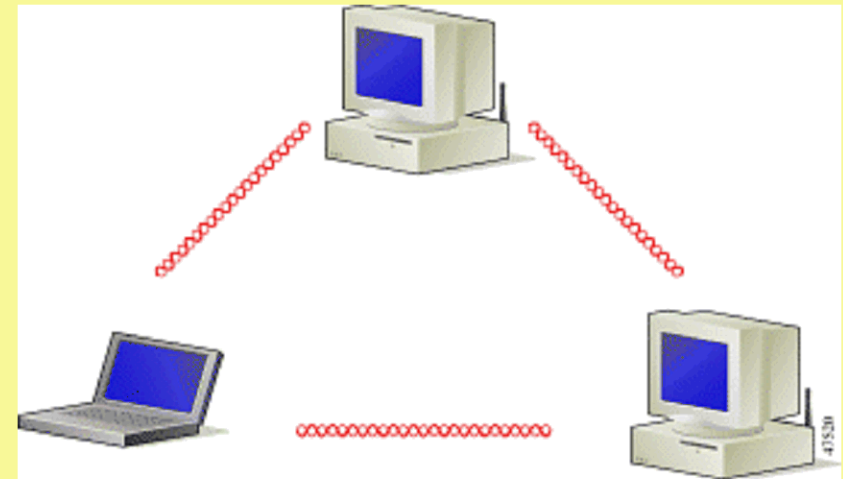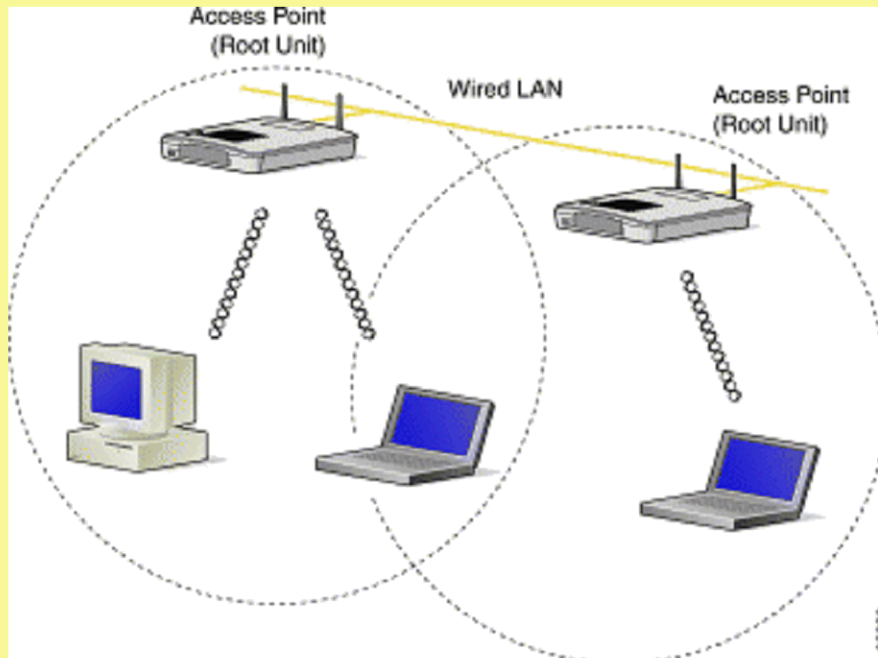- Drivers and Network Adaptors Troubleshooter

All are accessible through the Help and Support Center

The WinXP
Internet Connection Firewall

- Known as the ICF

- Built-in personal firewall

- Monitors traffic that comes from the internet

- Does *not* monitor traffic that starts from your computer

Topology

- Infrastructure
- Access Point

Ad Hoc

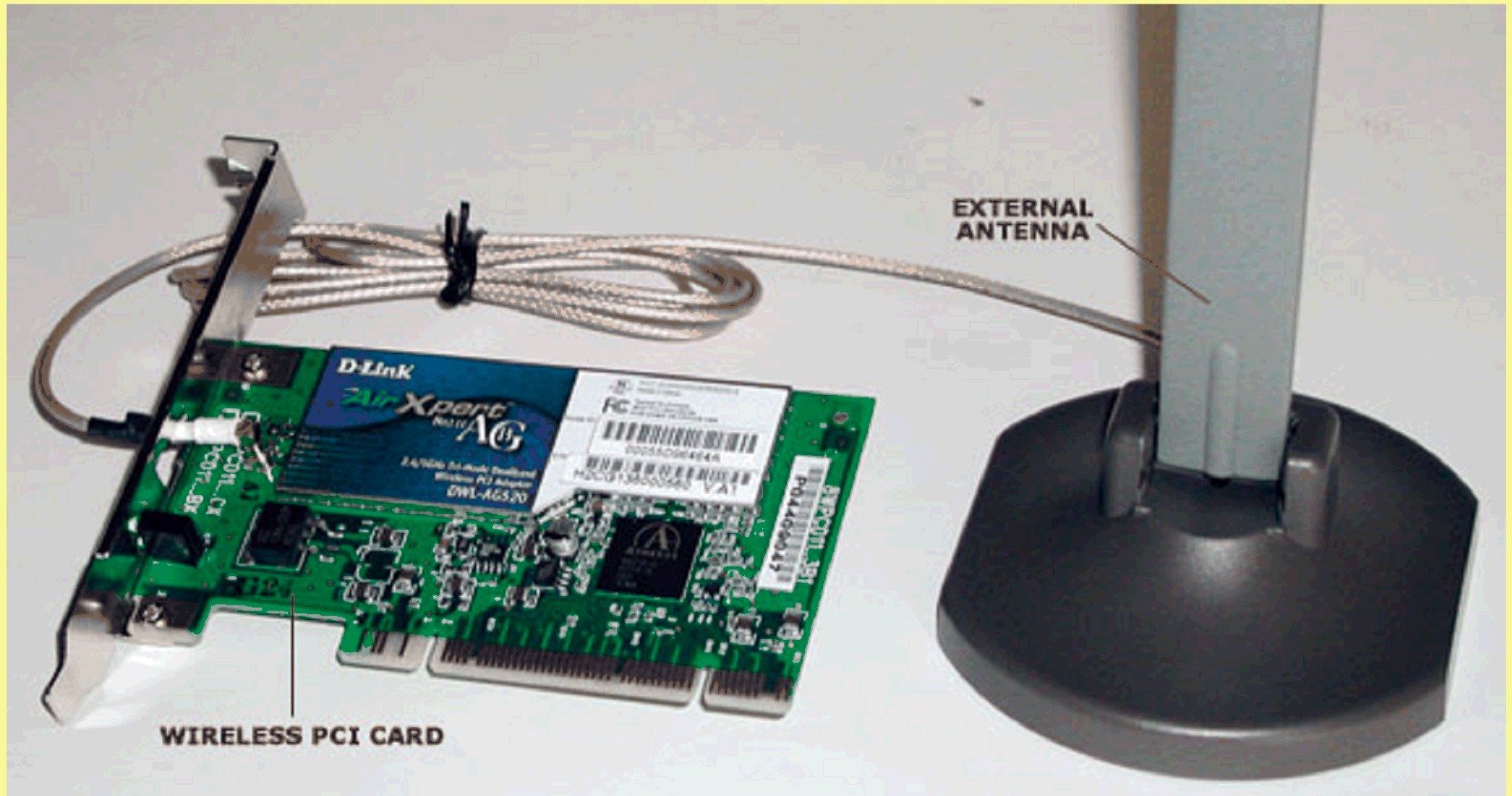# Connecting the broadband router

Wireless Access Point

Wireless PCI Card

EXTERNAL ANTENNA

WIRELESS PCI CARD

Installing Wireless PCI card

WIRELESS 802.11a/g
PCI CARD
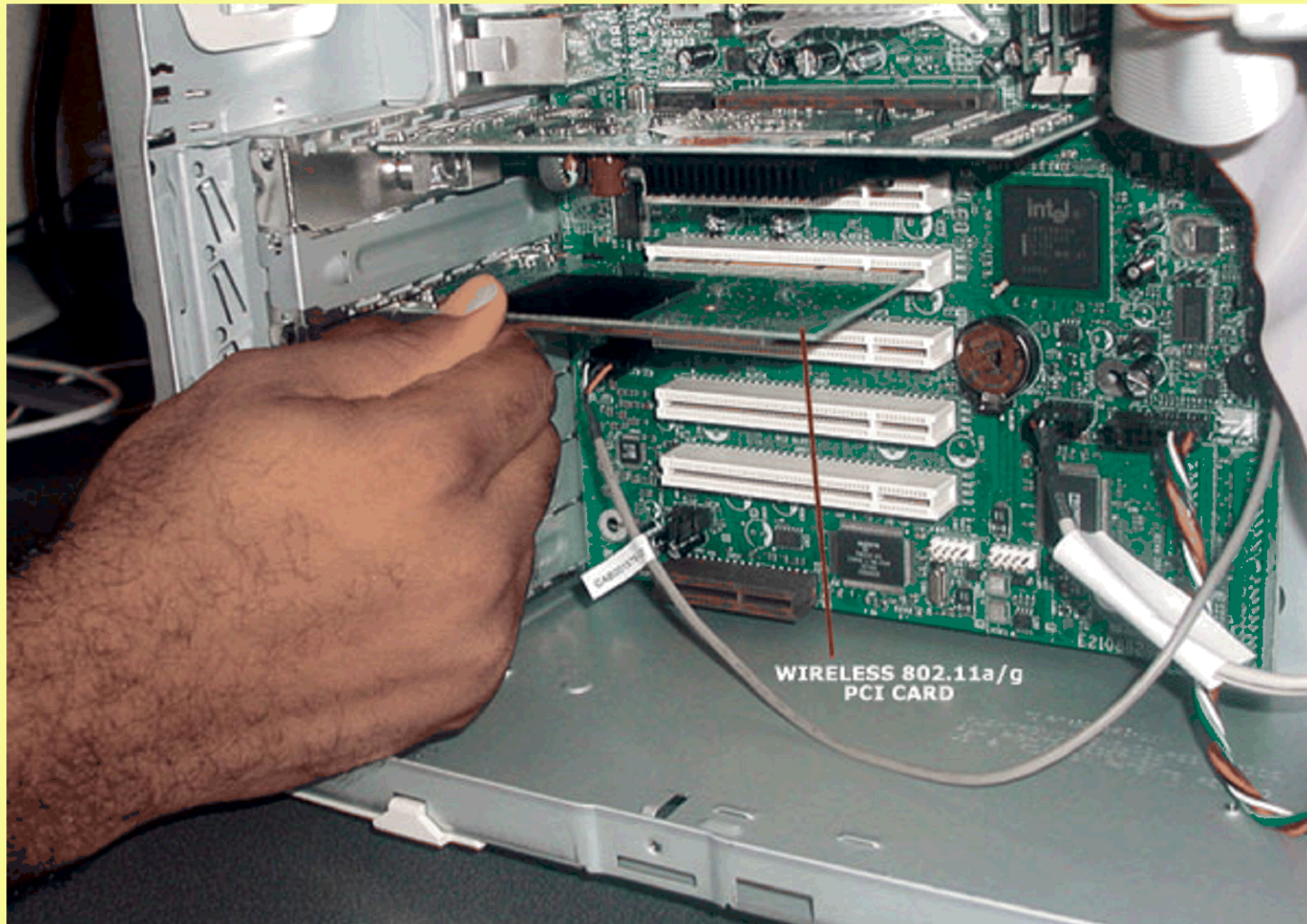
Install Notebook Wireless Card

WIRELESS
PCMCIA CARD

USB Wireless

Security Check

- Excellent site: www.grc.com
- Scroll down to find "Shields Up"
- Click and follow the simple instructions

Useful Web Sites

- http://www.homenethelp.com/
- http://www.practicallynetworked.com/
- http://compnetworking.about.com/od/wirelesssecurity/
- Videos: http://www.wireless-network-tutorial.com/download.htm

Acronyms

AES   Advanced Encryption Standard

DHCP   Dynamic Host Configuration Protocol

DMZ   Demilitarized Zone

DNS   Domain Name Server

DSL   Digital Subscriber Line

IP   Internet Protocol

MAC   Media Access Control Address

NAT   Network Address Translation

PPPoE   Point to Point Protocol over Ethernet

SSID   Service Set IDentifier

TCP/IP   Transmission Control Protocol/Internet Protocol

TKIP   Temporal Key Integrity Protocol (used with WPA)

URL   Uniform Resource Locator

VPN   Virtual Private Network

WEP   Wired Equivalent Privacy

WPA   Wi-Fi Protected Access™

WPA-PSK   WPA Pre-Shared-Key

Hands-on Configuration